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EXAMINER	
SINGH, RAMNANDAN P	
ART UNIT	**PAPER NUMBER**
2644	4

DATE MAILED: 03/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/859,687	SHEA, PHILLIP N.	
	Examiner	Art Unit	
	Ramnandan Singh	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 16 December 2003 have been fully considered but they are not persuasive.

(i) Applicant's argument--" The proposed combination of Ahmadi and Bennett does not teach or suggest training said artificial neural network to an ADSI standard" on page 7.

Examiner's response—In response to the Applicant's argument, it is noted that Ahmad teaches a method for training an artificial neural network (ANN) **with a realistic set of inputs,** determining an error by comparing the actual output to the desired outputs, and adjusting the weights according to the error. This process is continued iteratively until the error cannot be reduced further [col. 11, lines 6-17]. Thus, the ANN can operate in any application environment provided the ANN is adequately trained to learn the desired operational environment using the training data set representative of the various conditions imposed on the performance of the ANN. Further, since training the ANN is intrinsic to its operation in an application environment (i.e. **an ADSI environment),** a realistic set of inputs representative of the ADSI environment is required to be selected to train the ANN to detect call progress tones to an ADSI standard.

(ii) Applicant's argument--" The proposed combination of Ahmadi and Bennett does not teach or suggest determining call progress tones conforms to an ADSI standard" on page 7.

Examiner's response—In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the examiner asserts that the method of training an ANN is NOT dependent on a specific standard or operating environment, as shown by Ahmadi . The combination of Ahmad and Bennett teaches training an artificial neural network (ANN) **with a realistic set of inputs** representative of that standard or operating environment (i.e. **an ADSI standard**) to detect DTMF and call progress tones.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 6, 12, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitchin et al [US 5,319,702] in view of Ahmadi [EP 1093310].

Regarding claim 1, Kitchin et al teach a method for determining the state of a telephony call shown in Fig. 1C, comprising:

providing a pattern matching subsystem (i.e. **neural network**) (860) [col. 6, lines 39-43]; and employing the neural network to determine DTMF and call progress tones (650) [col. 2, lines 39-54; col. 10, lines 3-30; col. 12, lines 7-9; col. 20, lines 27-37; col. 21, lines 21-27; col. 23, lines 34-39].

Although Kitchin et al teach and employ the artificial neural network (ANN) (860), they don not disclose expressly the details of the method of training the ANN. As a result, one of ordinary skill in the art would have been motivated to seek detailed embodiments to enable the building of this invention. It would, therefore, have been obvious to use any known suitable training method of the ANN , such as that of Ahmadi, as the needed method in Kitchin et al.

Ahmad teaches a method of training an artificial neural network (ANN) **with a realistic set of inputs,** determining an error by comparing the actual output to the desired outputs, and adjusting the weights according to the error. This process is continued iteratively until the error cannot be reduced further [col. 11, lines 6-17]. Thus, the ANN can operate in any application environment provided the ANN is adequately

trained to learn the desired operational environment using the training data set representative of the various conditions imposed on the performance of the ANN. Further, since training the ANN is intrinsic to its operation in a new application environment (i.e. **an ADSI environment),** a realistic set of inputs representative of the ADSI environment is required to be selected to train the ANN to detect call progress tones to an ADSI standard.

Kitchin et al and Ahmadi are analogous art because they are from a similar problem solving area, viz. , DTMF and call progress tone detection in a telephone conversation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the training method of the ANN of Ahmadi with Kitchin et al.

The suggestion/motivation for doing so would have been to provide **a trained neural network** to detect tones more quickly than conventional tone detection methods [Ahmadi; Abstract].

Claims 6, 12, and 17 are essentially similar to claim 1.

4. Claims 1-5, 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahmadi [EP 1093310] in view of Bennett et al [US 5,311,589].

Regarding Claim 1, Ahmadi teaches a method and multi-frequency tone detector, using a neural network, for detecting a tone such as a DTMF tone in a telephone input signal during a telephone conversation shown in Fig. 1, wherein the tone has a pre-defined frequency profile. The telephone signal is converted to the frequency domain, and then signal features are extracted. Next, these features are inputted to a discriminator for discriminating, if the extracted features correspond to the pre-determined frequency profile, to detect the tone, wherein the discriminator comprises one or more artificial neural networks (ANN) for carrying out the discrimination [Figs. 1, 2; col. 1, line 51 to col. 3, line5]. The neural network is trained to detect the tone, or detect which of many predetermined tones are present [Abstract]. **Preferably, the detector is arranged to detect multi-frequency tones including DTMF tones.** Such tones are commonly found in telephone applications. The discriminator comprises two or more sub-discriminators working in parallel, each for discriminating a subset of frequencies of the tones separately [Figs. 1-6; col. 3, line 22 to col. 4, line 41; col. 8, line 45 to col. 9, line 4; col. 13, line 5 to col. 14, line 58].

Although Ahmadi teaches a tone detector to detect all **single tones and multi-frequency tones** commonly used in telephone applications wherein the multi-frequency tones include DTMF tones [col. 8, line 45 to col. 9, line 4],, he does not disclose explicitly determining call progress tones to determine the state of a telephony call.

Bennett et al teaches expressly detecting DTMF tones as well as call progress tones by determining the amplitudes of pre-selected frequencies in a signal over a predetermined time period, and determining a candidate tone by selecting two of the pre-selected frequencies with the highest amplitudes and comparing the two selected frequencies to known DTMF and call progress tone frequencies; wherein the DTMF digits are defined by the matrix of Table 1, and the call progress tones are defined by the matrix of Table 2, which are well-known in the art [col. 1 line 49 to col. 2, line 38; Abstract; col. 6, lines 10-20; col. 6, lines 36-59; col. 10, line 52 to col. 11, line 21].

Ahmadi and Bennett et al are analogous art because they are from a similar problem solving area, viz. , Multi-frequency tone detection in a telephone conversation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the call progress tone characteristics defined in Table 2 of Bennett et al with Ahmadi to enable the neural network to discriminate the call progress tones also.

The suggestion/motivation for doing so would have been to provide more calling features and services at a faster rate, namely, three-way calling, call waiting, redial busy, etc., that require recognizing audible signal tones, such as dual-tone, multi-frequency (DTMF) and call progress tones, which are generated by the network or local switching system [Bennett et al; col. 1, lines 14-29].

Claim 12 is essentially similar to claim 1 and is rejected for the reasons stated above apropos of Claim 1.

Regarding Claims 2 and 13, Ahmadi teaches detecting signaling tones accurately in talk-off, cur-through, or both by maintaining low error rates [col. 1, lines 37-53].

Regarding Claims 3 and 14, the combination of Ahmadi and Bennett et al teaches various states of the call progress providing one or more call options, such as call waiting, busy, etc. [Bennett et al; col. 2, lines 29-38 ; col. 11, lines 11-21 ; col. 13, line 55 to col. 14, line 8].

Regarding Claims 4 and 5, Ahmadi teaches both hardware and software implementations [col. 9, lines 12-20; col. 12, lines 26-37].

Regarding Claims 15 and 16, the limitations are shown above.

5. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahmadi [EP 1093310] in view of Bennett et al [US 5,311,589], and further, in view of Li [US 6,549,587 B1].

Regarding Claim 6, Ahmadi teaches a method and multi-frequency tone detector, using a neural network, for detecting a tone such as a DTMF tone in a telephone input signal during a telephone conversation shown in Fig. 1, wherein the tone has a pre-defined frequency profile. The telephone signal is converted to the frequency domain, and then signal features are extracted. Next, these features are inputted to a discriminator for discriminating, if the extracted features correspond to the pre-determined frequency profile, to detect the tone, wherein the discriminator comprises one or more artificial neural networks (ANN) for carrying out the discrimination [Figs. 1, 2; col. 1, line 51 to col. 3, line5]. The neural network is trained to detect the tone, or detect which of many predetermined tones are present [Abstract]. **Preferably, the detector is arranged to detect multi-frequency tones including DTMF tones.** Such tones are commonly found in telephone applications. The discriminator comprises two or more sub-discriminators working in parallel, each for discriminating a subset of frequencies of the tones separately [Figs. 1-6; col. 3, line 22 to col. 4, line 41; col. 8, line 45 to col. 9, line 4].

Although Ahmadi teaches a tone detector to detect all **single tones and multi-frequency tones** commonly used in telephone applications wherein the multi-frequency tones include DTMF tones [col. 8, line 45 to col. 9, line 4],, he does not disclose explicitly determining call progress tones to determine the state of a telephony call, and training the artificial neural network (ANN) using a telephone network simulator. It is,

however, well-known in the art that a telephone network simulator is used to derive design parameters of the telephone system.

Bennett et al teaches expressly detecting DTMF tones as well as call progress tones by determining the amplitudes of pre-selected frequencies in a signal over a predetermined time period, and determining a candidate tone by selecting two of the pre-selected frequencies with the highest amplitudes and comparing the two selected frequencies to known DTMF and call progress tone frequencies; wherein the DTMF digits are defined by the matrix of Table 1, and the call progress tones are defined by the matrix of Table 2, which are well-known in the art [col. 1 line 49 to col. 2, line 38; Abstract; col. 6, lines 10-20; col. 6, lines 36-59; col. 10, line 52 to col. 11, line 21].

Li teaches determining call progress tones [col. 37, lines 34-51], and determining loop filter parameters using a telephone network simulator [col. 67, line 58 to col. 68, line 65].

Ahmadi, Bennett et al and Li are analogous art because they are from a similar problem solving area, viz. , Multi-frequency tone detection in a telephone system.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the call progress tone characteristics defined in Table 2 of

Bennett et al with Ahmadi to enable the neural network to discriminate the call progress tones also; and use the telephone network simulator of Li to train the ANN of Ahmad for Fast and accurate operations.

The suggestion/motivation for doing so would have been to provide more calling features and services at a faster rate, namely, three-way calling, call waiting, redial busy, etc., that require recognizing audible signal tones, such as dual-tone, multi-frequency (DTMF) and call progress tones, which are generated by the network or local switching system [Bennett et al; col. 1, lines 14-29], and speed up the network operation using a trained ANN.

Claim 17 is essentially similar to claim 6 and is rejected for the reasons stated above apropos of Claim 6.

6. Claims 7, 9-11, 18, 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ahmadi, Bennett et al and Li as applied to claims 6 and 17 above, and further in view of Moses et al [Us 5,532,950].

Regarding Claim 7, over the combination of Ahmadi, Bennett et al and Li does not teach expressly a back-propagation algorithm to train a neural network. However, the back-propagation algorithm is a very well-known method for training an artificial neural network in the art.; and forms **an integral part** of the neural network system.

Moses et al teaches applying a back-propagation algorithm to train an artificial neural network [col. 7, lines 57-67]. Fig. 5 presents a flowchart describing the steps used in training the neural network 26 [col. 8, lines 27-34].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the back-propagation technique of Moses et al to train the ANN of Ahmadi , and improve performance of the telephone network.

Claim 18 is essentially similar to claim 7 and is rejected for the reasons stated above apropos of Claim 7.

Regarding Claims 9-10, Moses et al teaches training the ANN using a back-propagation algorithm, as outline in Fig. 5, using different sample rates and a learning rate factor [col. 8, line 35 to col. 10, line 21].

Regarding Claims 20-21, the limitations are shown above.

Regarding Claim 11, the hidden nodes are inherent features of an artificial neural network [Ahmadi; Fig. 6; col. 10, lines 45-51]. Further, Moses et al teaches a learning rate factor and hidden nodes 32 [Fig. 3; col. 8, line 35 to col. 10, line 21].

Claim 12 is essentially similar to claim 1 and is rejected for the reasons stated above apropos of Claim 1.

Claim 22 is essentially similar to claim 11 and is rejected for the reasons stated above apropos of Claim 11.

7. Claims 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ahmadi, Bennett et al and Li as applied to claims 6 and 17 above, and further in view of Weser et al [US 6,104,803].

Regarding Claim 8, the combination of Ahmadi, Bennett et al and Li does not teach expressly using an Analog Display services Interface (ADSI). However, it may be noted that a standard T1 carrier interface supports an ADSI interface, well-known in the art.

Weser et al teaches a T1 carrier interface 94 that supports an ADSI interface [col. 10, lines 41-45].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the ADSI interface containing call progress tones mixed with audio to train the neural network of Ahmadi, and improve performance of the ANN operating under mixed conditions.

Claim 19 is essentially similar to claim 8 and is rejected for the reasons stated above apropos of Claim 8.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(i) Bigus et al [US 5,155,763] teach a method for predicting dialing usinga neural networks [Figs. 1-9];

(ii) Fortier et al teaches speech recognition based on an ADSI standard;

(iii) Douma et al [US 5,583,965] teaches a method for training voice recognition system; and

(iv) Greenbalt [US 5,692,040] discloses a method for exchanging compatible universal identification telephone protocol [Fig. 4].

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ramnandan Singh whose telephone number is (703)308-6270. The examiner can normally be reached on M-F(8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester Isen can be reached on (703)-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ramnandan Singh
Examiner
Art Unit 2644

SPE, Art Unit 2644